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# DRYLAND SALINITY AND SEEPAGE IN ALBERTA

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Dryland Salinity and Seepage in Alberta.
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ALBERTA DRYLAND SALINITY COMMITTEE

1975

## RECOMMENDATIONS

Dryland Salinity (alkali) is caused by excessive moisture, aggrevated by cereal crops, summerfallow practices, and by entrapped snow and water. Recent research indicates the following recommendations are helpful in controlling dryland salinity:

1. Do not summerfallow areas contributing to the problem.
2. Eliminate barriers that trap snow and water.
3. Drain, where possible, surface accumulation of water.
4. Plant salt tolerant crops in the affected areas.
5. Plant deep rooted, high moisture use crops around and above the affected areas to intercept incoming water.
6. Use crop rotations that include forage.
7. Avoid excessive tillage of salt affected areas.

This brochure is prepared by the Alberta Dryland Salinity Committee, composed of:

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## INTRODUCTION

Farmers and government alike are alarmed by the rate at which dryland salinity is increasing. Approximately 250,000 acres of dryland in Alberta are affected by salinity. The most severely affected areas are in the vicinity of Vulcan, Claresholm and Warner.

## FORMATION OF DRYLAND SALINITY AND SEEPAGE AREAS

Areas of salinity and seepage have recently developed on non-irrigated cropland, causing a reduction in their productivity. These areas result from excess moisture passing through the soil to a shallow, less permeable layer, where it moves laterally downslope picking up salts. When the watertable approaches the soil-surface, a discharge area is formed. In the discharge area the water moves to the surface by capillary action, evaporates and leaves the salts to accumulate. (See figure 1). In early stages of development and special soil conditions these areas will be wet, but not show an accumulation of salt.

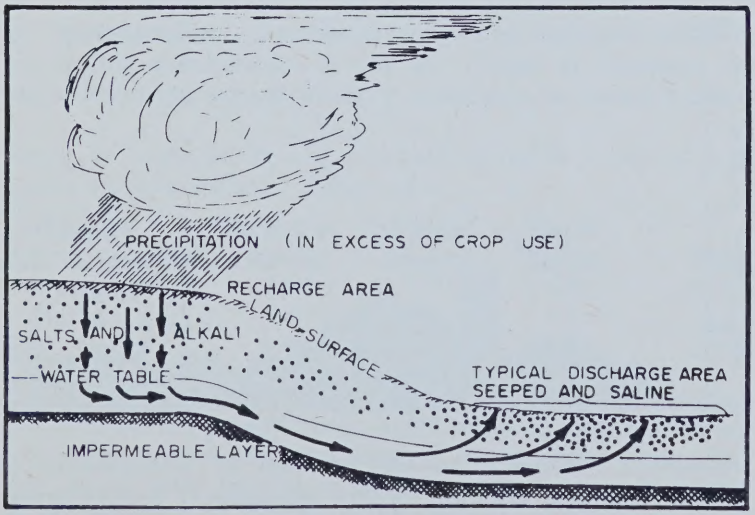


*Figure 1 Typical cause of Dryland Salinity (Montana).*

**C. Water and Snow Accumulation -** Any activity that causes water and snow to accumulate, especially in the recharge area, may aggrevate dryland salinity. Roadways, railways, borrow pits, sloughs, ponds, snow fences, wind breaks, buildings, tall weeds and fence lines can trap water and snow, and often alter natural drainage ways. Trapped water and snowmelt add to the groundwater through deep percolation and accumulated runoff.

## CONTROL AND MANAGEMENT OF DRYLAND SALINITY

To control dryland salinity the sources of excess water should be eliminated. The most logical way is to utilize the precipitation where it falls. Where runoff water accumulates, surface drainage should be considered.

Utilization of precipitation in place can be increased through recropping, especially in a rotation with forage crops with a high moisture consumption. Long term studies at the Lethbridge Research Station showed that average annual yields from continuous cropping were somewhat better than those from a summerfallow rotation (see Table 3).

*Table 3. Average annual spring wheat yield without fertilizer at the Lethbridge Research Station (Pittman).*

| Treatment | | Average Annual Yield |
|---|---|---|
| Recrop if moist to 27" | (1954-73) | 15.7 bu/acre |
| Wheat & Wheat & Fallow | (1951-73) | 14.8 bu/acre |
| Continuous | (1951-73) | 14.7 bu/acre |
| Fallow & Wheat | (1951-73) | 12.9 bu/acre |

In general, there are more returns from recropping. A consensus Report by the Alberta Economics Branch on Costs and Returns from barley in the Vulcan-Champion area showed $10.55 annually more returns per acre from recropping than from a summerfallow-crop rotation (Table 4).

*Table 4. Costs and returns from growing barley in the Vulcan-Champion area, (C.R.D. 18-1-74).*

| | Stubble | Fallow |
|---|---|---|
| Cash Production Cost | | |
| Cultural & Harvest | 19.99 | 11.32 |
| Overhead | 4.74 | 4.27 |
| Inventory Cost | | |
| Land $150.00/acre @ 7% | 10.50 | 10.50 |
| Equipment & Buildings | 11.92 | 13.66 |
| Labour $3.00/hour | 3.59 | 2.96 |
| Summerfallow Cost | | 19.87 |
| Total Cost/2 Years | 101.48 | 62.58 |
| Return* | | |
| Stubble (90 bu./2 years) | 180.00 | |
| Fallow (60 bu./2 years) | | 120.00 |
| Return to Management per Year | $ 39.20 | $ 28.71 |

* Based on a barley price of $2.00 per bushel.

When recropping is practiced, several factors should be considered:

**A. Spring Soil Moisture -** As a rule of thumb, if the soil is moist to 2½ feet in clay soil or 4 feet in sandy soil at the time of seeding, there is sufficient moisture to recrop and produce average yields, under normal seasonal precipitation.

**B. Snow Control -** To supplement spring soil moisture, it may be necessary to use practices that will hold snow in place. This may be accomplished by tall stubble, barriers and ridging of snow. In Montana, tall stubble captured 2 inches more moisture over winter than did a bare field.

**C. Fertility -** Under recropping, more fertilizer will be required, especially nitrogen, to obtain good yields. Available nitrogen is normally built up during the fallow year of a summerfallow-crop rotation. Also, soil moisture use efficiency by crops is greater in fertile soil. To determine fertilizer requirements for highest yield, soil tests will be required regularly.

**D. High Moisture Use Crops** - As a rule, forage crops use more water than cereal crops and use it for a longer period during the growing season (Figure 2). Moreover, these forage crops extract moisture to a greater depth (Table 1).

Crops with high moisture use extract more moisture, which will result in lowering the watertable. High moisture use crops should be planted around the discharge area to intercept incoming ground water and in rotation in the recharge area to use the precipitation where it falls. Of the cereals, fall seeded crops use more moisture and to a greater depth than spring planted crops.

**E. Salt Tolerance** - Crops vary in salt tolerance. Therefore, when selecting a crop for the saline (discharge) area, the salt tolerance of the plant species should be considered (Table 5).

*Table 5. Salt tolerance of various plant species.*

| Tolerance | EC* | Crops | Forage |
|---|---|---|---|
| | 18 | | Tall Wheatgrass |
| High | | Barley | Russian Wild Ryegrass |
| | 12 | | Slender Wheatgrass |
| | | Winter Wheat | |
| | | Rye | Sweet Clover |
| Moderate | | Oats | Alfalfa |
| | | Spring Wheat | |
| | | Rape | |
| | | Corn | Brome |
| | 4 | Flax | Reed Canarygrass |
| Low | | Peas | |
| | 2 | Beans | Clover |

*Electrical Conductivity

At no time, where possible, should a saline area be left bare for an extended period. According to Dr. T. Lawrence, Research Station, Swift Current, areas that are too saline for the production of cereal grains should be seeded to a mixture of forage crops, as follows:

3 lbs. Sawki or Mayak Russian Wild Ryegrass
2 lbs. Summit or Nordan Crested Wheatgrass
8 lbs. Orbit Tall Wheatgrass and
2 lbs. Rambler or Roamer Alfalfa per acre

Saline areas subject to 2 to 5 weeks of spring flooding should be seeded to:

3 lbs. Frontier or Caster Reed Canarygrass
4 lbs. Carlton Bromegrass
8 lbs. Orbit Tall Wheatgrass
3 lbs. Primar or Revenue Slender Wheatgrass and
1 lb. Rambler Alfalfa per acre

**F. Weed Control -** If recropping is practiced, weeds will be more difficult to control. When it is not possible to control weeds effectively with herbicides, a year of summerfallow may be required. Inclusion of forage crops in the rotation is another effective weed control practice.

Foxtail and Kochia are the most common weeds found in the saline areas. Foxtail, a native perennial salt tolerant grass, can be controlled by tillage. Kochia, an annual broadleaved plant, with a prolific seeding habit can be controlled by tillage and broadleaf herbicides. Kochia can also be cut before seed setting and fed to livestock mixed with other feed.

To prepare a seed bed for forage in saline soils, all weeds should be killed and a firm seed bed established.

## SUMMARY

Dryland salinity and seepage areas are increasing in Alberta. They are caused by an accumulation of soluble salts and excess moisture at the soil surface, which results in reduced yields. Cultural practices that have contributed to the problem are: cereal crops, unnecessary summerfallowing, snow and water traps, etc.

For controlling the problem, some modifications of our farming methods will be necessary in both the recharge and discharge areas, in order that the moisture will be used in place.

## NOTES

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